

Claims:

1. An electrical connector for secure retention of a signal transmission line to a detonator, the detonator having an opening provided for connection to said signal
5 transmission line and being adapted to initiate in response to one or more electrical signals received via the signal transmission line, the electrical connector comprising:
a body of electrically insulating material adapted to form a plug member for said opening of said detonator;
at least one bridge element comprising electrically conductive material extending
10 through said plug member and having parts that emerge from said plug member; and
retaining means for retaining each of said at least one bridge element in said plug member to cause said at least one bridge element to resist slippage between said at least one bridge element and said plug member.
- 15 2. The electrical connector of claim 1, wherein each retaining means comprises a part of said at least one bridge element in contact with said insulating material, said part comprising at least one surface that extends at an angle to a direction of force applied to said at least one bridge element by pulling or tugging one of said parts that emerge from said plug member, thereby causing said at least one bridge element to resist slippage
20 between said at least one bridge element and said plug member.
3. The electrical connector of claim 1, wherein the retaining means bonds or clamps said at least one bridge element within said plug member.
- 25 4. The electrical connector of claim 1, wherein said parts that emerge from said plug member, emerge on opposite sides thereof.
5. The electrical connector of claim 1, wherein said at least one bridge element comprises a first end and a second end, each first end being adapted for attachment to a
30 signal transmission line, and each second end being adapted for contact with an electrical component of the detonator.

6. The electrical connector of claim 5, wherein each first end comprises a wire clasp or crimp for grasping the end of a wire emerging from the signal transmission line.

7. The electrical connector of claim 5, wherein said electrical component is selected from the group consisting of: a printed circuit board or a component thereof, means to allow protection from electrostatic damage to other electronic components of the detonator, a resistor, a varistor, a zener diode, a suppressor diode, an encapsulated integrated circuit, an SO8 packaging, a filter, a capacitor, a spark gap, a small outline integrated circuit, and a rectifier, or alternatively said electrical component is connected to a printed circuit board or a component thereof, means to allow protection from electrostatic damage to other electronic components of the detonator, a resistor, a varistor, a zener diode, a suppressor diode, an encapsulated integrated circuit, or an SO8 packaging, a printed circuit board or a component thereof, a resistor, a filter, a capacitor, a spark gap, a small outline integrated circuit or a rectifier.

15

8. The electrical connector of claim 1, wherein said at least one bridge element comprises a metal, a metal alloy, a ceramic, a rigid polymer, or a semiconductor.

9. The electrical connector of claim 8, wherein said at least one bridge element consists of a metal.

10. The electrical connector of claim 9, wherein said at least one bridge element is formed by stamping a template from sheet metal.

11. The electrical connector of claim 2, wherein said part of said at least one bridge element that is in contact with said insulating material is adapted for abutment, impalement or engagement with an internal surface of said plug member, thereby to serve as the retaining means to retain said at least one bridge element in position within said plug member.

30

12. The electrical connector of claim 11, wherein application of a pulling or tugging force to one of said parts that emerge from said plug member, causes said portion adapted for abutment, impalement or engagement with said internal surface of said plug member

to impart a resistive force upon said internal surface, thereby causing each bridge element to resist slippage between each bridge element and said plug member .

13. The electrical connector of claim 2, wherein said part of said at least one bridge
5 element that is in contact with said insulating material comprises a bent, sinusoidal, coiled or stepped portion configured for interaction with an internal surface of the plug member.

14. The electrical connector of claim 13, wherein said part of said at least one bridge
10 element that is in contact with said insulating material comprises a portion comprising at least one barb, hook or spike for impalement into an internal surface of the plug member.

15. The electrical connector of claim 14, wherein said at least one bridge element
comprises a first end and a second end, each first end being adapted for attachment to a
signal transmission line, and each second end being adapted for contact with an electrical
15 component of the detonator, each barb, spike, or hook extending in a direction generally away from said second end.

16. The electrical connector of claim 1, wherein each retaining means comprises a
portion of each bridge element having a convoluted path through the plug member such
20 that the at least one bridge element frictionally engages the plug member to retain said at least one bridge element within the plug member.

17. The electrical connector of claim 1, wherein each retaining means is introduced
into the plug member as a settable material and is set.
25

18. The electrical connector of claim 1, wherein the plug member includes a portion
adapted to extend into and frictionally engage with an internal surface of the shell of the
detonator at said opening thereof.

30 19. The electrical connector of claim 1, wherein the plug member further includes an annular recess to receive a detonator crimp, thereby to secure said plug member at said opening of the detonator.

20. The electrical connector of claim 1, wherein the plug member includes a threaded portion for threaded engagement with an internal surface of the detonator at said opening thereof.
- 5 21. The electrical connector of claim 1, wherein the body of electrically insulating material comprises at least one bend and said at least one bridge element comprises at least one corresponding bend thereby to cause engagement therebetween, so as at least to assist in retention of said at least one bridge element within said plug member.
- 10 22. The electrical connector of claim 1, further comprising a sheath element for sheathing at least one electrical connection between said signal transmission line and said at least one bridge element, the sheath element comprising:
- (a) an elongate body adapted for association at one end thereof with the electrical connector; and
- 15 (b) a longitudinal bore extending therethrough for receiving the signal transmission line and at least a portion of each bridge element.
23. The electrical connector of claim 22, wherein the sheath element is at least partially made of a flexible material.
- 20 24. The electrical connector of claim 22, wherein the sheath element is adapted for releasable engagement with the electrical connector such that the sheath element can be selectively disengaged from the electrical connector to expose said at least one bridge element and / or said at least one electrical connection.
- 25 25. The electrical connector of claim 22, wherein the sheath element is permanently fixed to the electrical connector.
26. The electrical connector of claim 22, wherein the sheath element and the electrical
30 connector are unitary in construction.

27. The electrical connector of claim 22, wherein the sheath element further comprises one or more transverse ridges along the body to impart flexibility to the sheath element.
- 5 28. The electrical connector of claim 22, wherein the sheath element further comprises a flex point defined by a narrow portion of the elongate body.
29. The electrical connector of claim 24, wherein the releasable engagement is provided by a friction fit or an interference fit.
- 10 30. A sheath element for connection to the electrical connector of claim 1, said sheath element for sheathing electrical connections between said signal transmission line and said at least one bridge element, said sheath element comprising:
- (a) an elongate body adapted for association at one end with the electrical
- 15 connector; and
- (b) a longitudinal bore extending therethrough for receiving the signal transmission line and at least a portion of each bridge element.
31. The sheath element of claim 30, wherein the sheath element is at least partially
- 20 made of a flexible material.
32. The sheath element of claim 30, wherein the sheath element is adapted for releasable engagement with the electrical connector such that the sheath element can be selectively disengaged from the electrical connector to expose said at least one bridge
- 25 element and / or said at least one electrical connection.
33. The sheath element of claim 30, wherein the sheath element is permanently fixed to the electrical connector.
- 30 34. The sheath element of claim 30, wherein the sheath element and the electrical connector are unitary in construction.

35. The sheath element of claim 30, further comprising one or more transverse ridges along the body to impart flexibility to the sheath element.
36. The sheath element of claim 30, further comprising a flex point defined by a
5 narrow portion of the elongate body.
37. The sheath element of claim 32, wherein the releasable engagement is provided by a friction fit or an interference fit.
- 10 38. An assembly comprising the electrical connector of any one of claims 1 to 29, in combination with at least one electrical component of a detonator, said at least one bridge element in electrical contact with said at least one electrical component.
39. The assembly according to claim 38, wherein said at least one electrical
15 component is selected from the group consisting of: a printed circuit board or a component thereof, means to allow protection from electrostatic damage to other electronic components of the detonator, a resistor, a varistor, a zener diode, a suppressor diode, an encapsulated integrated circuit, an SO8 packaging, a filter, a capacitor, a spark gap, a small outline integrated circuit, and a rectifier, or alternatively said electrical
20 component is connected to a printed circuit board or a component thereof, means to allow protection from electrostatic damage to other electronic components of the detonator, a resistor, a varistor, a zener diode, a suppressor diode, an encapsulated integrated circuit, or an SO8 packaging, a printed circuit board or a component thereof, a resistor, a filter, a capacitor, a spark gap, a small outline integrated circuit, or a rectifier. .
- 25 40. The assembly according to claim 38, wherein said at least one bridge element is soldered to at least one circuit element of a printed circuit board.
41. A detonator assembly comprising:
30 a detonator shell including a percussion-actuation end and an opening at an end opposite said percussion-actuation end;
a base charge adjacent the percussion-actuation end of the shell;

the assembly of claim 38, fixed to said detonator shell at least in part by securing said plug member to said opening, said at least one electrical component being retained within the shell, said at least one bridge element including a part that emerges from said plug member within said shell for electrical contact with said at least one electrical
5 component, and a part that emerges from said plug member and extends away from said shell for electrical contact with a signal transmission line ; and

initiation means associated with said at least one electrical component for transfer of one or more appropriate initiation signals to the base charge for actuation thereof in response to appropriate signal(s).

10